CLAIMS

1. A polymer nanolithography method, comprising the steps of:

providing an atomic force microscope;

providing a conductive cantilever tip within said atomic force microscope;

providing a thin polymer film mounted upon a conductive wafer;

installing said thin polymer film within said atomic force microscope;

establishing a relative humidity within said atomic force microscope between about 10 to about 70 percent;

setting an initial tip-surface distance by applying a voltage to said cantilever tip such that no mechanical deformation of the surface of said polymer film during scanning occurs; and,

forming nanoscale features upon said polymer by selectively varying said voltage applied to said cantilever tip to effect a desired localized softening of attoliters of said polymer by Joule heating.

2. The method of claim 1 further including the step of erasing said polymer by annealing at a temperature greater than T_g for a sufficient time to remove said nanoscale features.

3. A polymer nanolithography method, comprising the steps of:

providing an atomic force microscope;

providing a highly conductive tungsten carbide cantilever tip within said atomic force microscope;

growing a thin polymer film upon a conductive wafer;

installing said thin polymer film within said atomic force microscope;

establishing a relative humidity within said atomic force microscope between about 10 to about 70 percent;

setting an initial tip-surface distance by applying a voltage to said cantilever tip such that no mechanical deformation of the surface of said polymer film during scanning occurs; and,

forming nanoscale features upon said polymer by selectively varying said voltage applied to said cantilever tip to effect a desired localized softening of attoliters of said polymer by Joule heating.

4. The method of claim 3 further including the step of erasing said polymer by annealing at a temperature greater than T_g for a sufficient time to remove said nanoscale features.

5. A polymer nanolithography method, comprising the steps of:

providing an atomic force microscope;

providing a conductive cantilever tip within said atomic force microscope;

providing a thin polymer film mounted upon a conductive wafer;

installing said thin polymer film within said atomic force microscope;

establishing a relative humidity within said atomic force microscope between about 10 to about 70 percent;

setting an initial tip-surface distance by applying a voltage to said cantilever tip such that no mechanical deformation of the surface of said polymer film during scanning occurs; and,

forming nanoscale features upon said polymer by selectively varying said voltage applied to said cantilever tip to effect a desired localized softening of attoliters of said polymer by Joule heating, said voltage being varied to generate a first level of current in said polymer for forming raised features and a second, higher level of current for forming depressed features in said polymer.

6. The method of claim 5 further including the step of erasing said polymer by annealing said polymer at a temperature greater than T_g for a sufficient time to remove said nanoscale features.

7. A polymer nanolithography method, comprising the steps of:

providing an atomic force microscope;

providing a highly conductive tungsten carbide cantilever tip within said atomic force microscope;

growing a thin polymer film upon a conductive wafer;

installing said thin polymer film within said atomic force microscope;

establishing a relative humidity within said atomic force microscope between about 10 to about 70 percent;

setting an initial tip-surface distance by applying a voltage to said cantilever tip such that no mechanical deformation of the surface of said polymer film during scanning occurs; and,

forming nanoscale features upon said polymer by selectively varying said voltage applied to said cantilever tip to effect a desired localized softening of attoliters of said polymer by Joule heating, said voltage being varied to generate a first level of current in said polymer for forming raised features and a second, higher level of current for forming depressed features in said polymer.

8. The method of claim 7 further including the step of erasing said polymer by annealing at a temperature greater than T_g for a sufficient time to remove said nanoscale features.